WHAT IS CLAIMED IS:

1. A network system, comprising:

a radio terminal having a first communication interface usable for reception only and a second communication interface usable for transmission and reception;

a first sub-network to which the radio terminal can be connected through a radio base station of a downlink radio network by using the first communication interface;

a second sub-network to which the radio terminal can be connected through a bidirectional communication network by using the second communication interface, the second sub-network being connected with the first sub-network through a backbone network; and

a packet relay device configured to receive a request message requesting a protocol processing with respect to the first sub-network from the radio terminal through the second sub-network, and carry out the protocol processing on the first sub-network according to the request message on behalf of the radio terminal, such that a response message corresponding to the request message obtaining by the protocol processing is returned from the first sub-network to the radio terminal through the downlink radio network or the bidirectional communication network.

2. The network system of claim 1, wherein the radio terminal is configured to receive a notification message indicating an existence or an address of the packet relay device on the first sub-network through the downlink radio network by using the first communication interface when the radio terminal enters a radio area of the radio base station, and transmit the request message after receiving the notification message at the first communication interface, by encapsulating the request message into an IP

(Internet Protocol) packet destined to the address of the packet relay device obtained according to the notification message and transmitting the IP packet from the second communication interface;

the packet relay device is configured to decapsulate the IP packet received from the radio terminal through the second sub-network, carry out the protocol processing on behalf of the radio terminal according to the request message taken out from the IP packet, and transmit the response message in a form of a prescribed packet that can be received by the second communication interface of the radio terminal through the second sub-network; and

the radio terminal is also configured to process the response message contained in the prescribed packet received by the second communication interface.

3. A packet relay device for use in a network system containing a radio terminal having a first communication interface usable for reception only and a second communication interface usable for transmission and reception, a first sub-network to which the radio terminal can be connected through a radio base station of a downlink radio network by using the first communication interface, and a second sub-network to which the radio terminal can be connected through a bidirectional communication network by using the second communication interface, the second sub-network being connected with the first sub-network through a backbone network, the packet relay device comprising:

a communication interface configured to receive an encapsulated IP packet containing a request message requesting a protocol processing with respect to the first sub-network, which is transferred from the radio terminal located in a radio area of the radio base station through the second sub-network;

a processing unit configured to decapsulate the

encapsulated IP packet received by the communication interface so as to take out the request message, and carry out the protocol processing on the first sub-network according to the request message on behalf of the radio terminal.

4. The packet relay device of claim 3, wherein the communication interface is also configured to transmit a response message corresponding to the request message obtained by the protocol processing in a form that can be received by the radio terminal through the second sub-network.

5. The packet relay device of claim 4, wherein the communication interface is configured to transmit the response message by rewriting a destination address of the response message into an IP (Internet Protocol) address acquired by the radio terminal at a second sub-network side.

6, The packet relay device of claim 4, wherein the communication interface is configured to transmit the response message by encapsulating the response message into an IP (Internet Protocol) packet destined to an IP address acquired by the radio terminal at a second sub-network side.

7. The packet relay device of claim 3, wherein when the request message is a DHCP (Dynamic Host Configuration Protocol) request message, the processing unit transmits the DHCP request message to the first sub-network and receives a DHCP response message from a DHCP server that processed the DHCP request message.

8. A radio terminal for use in a network system

containing a first sub-network to which the radio terminal can be connected through a radio base station of a downlink radio network, a second sub-network to which the radio terminal can be connected through a bidirectional communication network, the second sub-network being connected with the first sub-network through a backbone network, and a packet relay device for carrying out a protocol processing on the first sub-network on behalf of the radio terminal, the radio terminal comprising:

a first communication interface usable for reception only, by which the radio terminal can be connected to the first sub-network, which is configured to receive a notification message indicating an existence or an address of the packet relay device on the first sub-network through the downlink radio network when the radio terminal enters a radio area of the radio base station;

a second communication interface usable for transmission and reception, by which the radio terminal can be connected to the second sub-network, which is configured to transmit a request message requesting a protocol processing with respect to the first sub-network after receiving the notification message at the first communication interface, by encapsulating the request message into an IP (Internet Protocol) packet destined to the address of the packet relay device obtained according to the notification message and transmitting the IP packet through the second sub-network; and

a processing unit configured to process a response message corresponding to the request message obtained by the protocol processing.

9. The radio terminal of claim 8, wherein the second communication interface is also configured to receive the response message transmitted from the packet relay device through the second sub-network.

10. The radio terminal of claim 8, wherein when the response message is an encapsulated IP packet, the second communication interface decapsulates the encapsulated IP packet so as to take out the response message and gives the response message taken out from the encapsulated IP packet to the processing unit.

11. The radio terminal of claim 8, wherein the notification message is provided in a form of a specific message to be regularly transmitted by the radio base station or a specific node provided in the first sub-network, and the first communication interface is configured to acquire information indicating the existence or the address of the packet relay device by receiving the specific message regularly transmitted by the radio base station or the specific node.

12. The radio terminal of claim 8, wherein the second communication interface transmits the request message in a form of a broadcast packet with respect to the first sub-network or a multicast packet with respect to a prescribed group of nodes on the first sub-network.

13. The radio terminal of claim 8, wherein the second communication interface transmits the request message which is any one of a DHCP (Dynamic Host Configuration Protocol) request message with respect to the first sub-network, a router solicitation message with respect to the first sub-network, an IGMP (Internet Group Management Protocol) report message with respect to a multicast router on the first sub-network, an ARP (Address Resolution Protocol) response message with respect to the first sub-network, and an SLP (Service Location Protocol) request message with respect to the first sub-network.

14. The radio terminal of claim 13, wherein when the request message if the DHCP request message, upon receiving a DHCP response message corresponding to the DHCP request message, the processing unit sets the second communication interface as a transmission interface and the first communication interface as a reception interface with respect to an IP (Internet Protocol) address allocated to the radio terminal on the first sub-network that is contained in the DHCP response message.

15. A packet processing method in a network system containing a radio tarrying out the protocol processing o network according to the request message on behalf of the radio terminal at the packet relay device; and

returning a response message corresponding to the request message obtained by the protocol processing from the first sub-network to the radio terminal through the downlink radio network or the bidirectional communication network.

16. The method of claim 15, further comprising:

receiving at the radio terminal a notification message indicating an existence or an address of the packet relay device on the first sub-network through the downlink radio network by using the first communication interface when the radio terminal enters a radio area of the radio base station:

transmitting from the radio terminal the request message after receiving the notification message at the first communication interface, by encapsulating the request message into an IP (Internet Protocol) packet destined to the address of the packet relay device obtained according to the notification message and transmitting the IP packet from the second communication interface:

decapsulating the IP packet received from the radio terminal through the second sub-network at the packet relay device, such that the protocol processing is carried out on behalf of the radio terminal according to the request message taken out from the IP packet at the packet relay device;

transmitting the response message in a form of a prescribed packet that can be received by the second communication interface of the radio terminal through the second sub-network from the packet relay device: and

processing the response message contained in the prescribed packet received by the second communication interface at the radio terminal.

17. A packet processing method at a packet relay device in a network system containing a radio terminal having a first communication interface usable for reception only and a second communication interface usable for transmission and reception, a first sub-network to which the radio terminal can be connected through a radio base station of a downlink radio network by using the first communication interface, a second sub-network to which the radio terminal can be connected through a bidirectional communication network by using the second communication interface, and the second sub-network being connected with the first sub-network through a backbone network, the method comprising:

receiving an encapsulated IP packet containing a request message requesting a protocol processing with respect to the first sub-network, which is transferred from the radio terminal located in a radio area of the radio base station through the second sub-network; and

decapsulating the encapsulated IP packet received by the receiving step so as to take out the request message, and carrying out the protocol processing on the first sub-network according to the request message on behalf of the

radio terminal.

18. A packet processing method at a radio terminal in a network system containing a first sub-network to which the radio terminal can be connected through a radio base station of a downlink radio network, a second sub-network to which the radio terminal can be connected through a bidirectional communication network, the second sub-network being connected with the first sub-network through a backbone network, and a packet relay device for carrying out a protocol processing on the first sub-network on behalf of the radio terminal, the method comprising:

receiving a notification message indicating an existence or an address of the packet relay device on the first sub-network through the downlink radio network when the radio terminal enters a radio area of the radio base station, using a first communication interface usable for reception only, by which the radio terminal can be connected to the first sub-network;

transmitting a request message requesting a protocol processing with respect to the first sub-network after receiving the notification message at the first communication interface, by encapsulating the request message into an IP (Internet Protocol) packet destined to the address of the packet relay device obtained according to the notification message and transmitting the IP packet through the second sub-network, using a second communication interface usable for transmission and reception, by which the radio terminal can be connected to the second sub-network; and

processing a response message corresponding to the request message obtained by the protocol processing.

19. A computer usable medium having computer readable program codes embodied therein for causing a computer to

function as a packet relay device in a network system containing a radio terminal having a first communication interface usable for reception only and a second communication interface usable for transmission and reception, a first sub-network to which the radio terminal can be connected through a radio base station of a downlink radio network by using the first communication interface, and a second sub-network to which the radio terminal can be connected through a bidirectional communication network by using the second communication interface, the second sub-network being connected with the first sub-network through a backbone network, the computer readable program codes include:

a first computer readable program code for causing said computer to receive an encapsulated IP packet containing a request message requesting a protocol processing with respect to the first sub-network, which is transferred from the radio terminal located in a radio area of the radio base station through the second sub-network; and

a second computer readable program code for causing said computer to decapsulate the encapsulated IP packet received by the first computer readable program code so as to take out the request message, and carry out the protocol processing on the first sub-network according to the request message on behalf of the radio terminal.

20. A computer usable medium having computer readable program codes embodied therein for causing a computer to function as a radio terminal in a network system containing a first sub-network to which the radio terminal can be connected through a radio base station of a downlink radio network, a second sub-network to which the radio terminal can be connected through a bidirectional communication network, the second sub-network being connected with the

first sub-network through a backbone network, and a packet relay device for carrying out a protocol processing on the first sub-network on behalf of the radio terminal, the computer readable program codes include:

a first computer readable program code for causing said computer to receive a notification message indicating an existence or an address of the packet relay device on the first sub-network through the downlink radio network when the radio terminal enters a radio area of the radio base station, using a first communication interface usable for reception only, by which the radio terminal can be connected to the first sub-network;

a second computer readable program code for causing said computer to transmit a request message requesting a protocol processing with respect to the first sub-network after receiving the notification message at the first communication interface, by encapsulating the request message into an IP (Internet Protocol) packet destined to the address of the packet relay device obtained according to the notification message and transmitting the IP packet through the second sub-network, using a second communication interface usable for transmission and reception, by which the radio terminal can be connected to the second sub-network; and

a third computer readable program code for causing said computer to process a response message corresponding to the request message obtained by the protocol processing.